

HYDROGEN PERMEATION THROUGH DUPLEX MEMBRANE

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The using of protective coatings is one of the main ways to reduce hydrogen permeation through structural materials. Considering the hydrogen permeation through such multilayer membrane it is usually suggested that the ratio of hydrogen concentrations at the interface is equal to that of the hydrogen equilibrium solubilities in these materials. However during diffusion permeation the hydrogen concentrations at interface are not equilibrium values but they are determined by diffusion input D_1/d_1 and output D_2/d_2 rates and by passage rate through interface which is proportional to ratio of equilibrium solubilities S_1 and S_2 (d_i , D_i – thickness of and hydrogen diffusivity in i-layer, respectively). Therefore the ratio of hydrogen concentrations at interface can be adopted by ratio $(S_1 \cdot D_1/d_1) / (S_2 \cdot D_2/d_2)$. Under this approximation the analysis of hydrogen permeation through duplex membrane in diffusion-limited regime showed that the coating of the same materials can both decrease and increase the hydrogen permeability of system depending on the ratio of these parameters. In this case it is possible to explain the contradictory results of experiments on hydrogen permeation through duplex membranes.